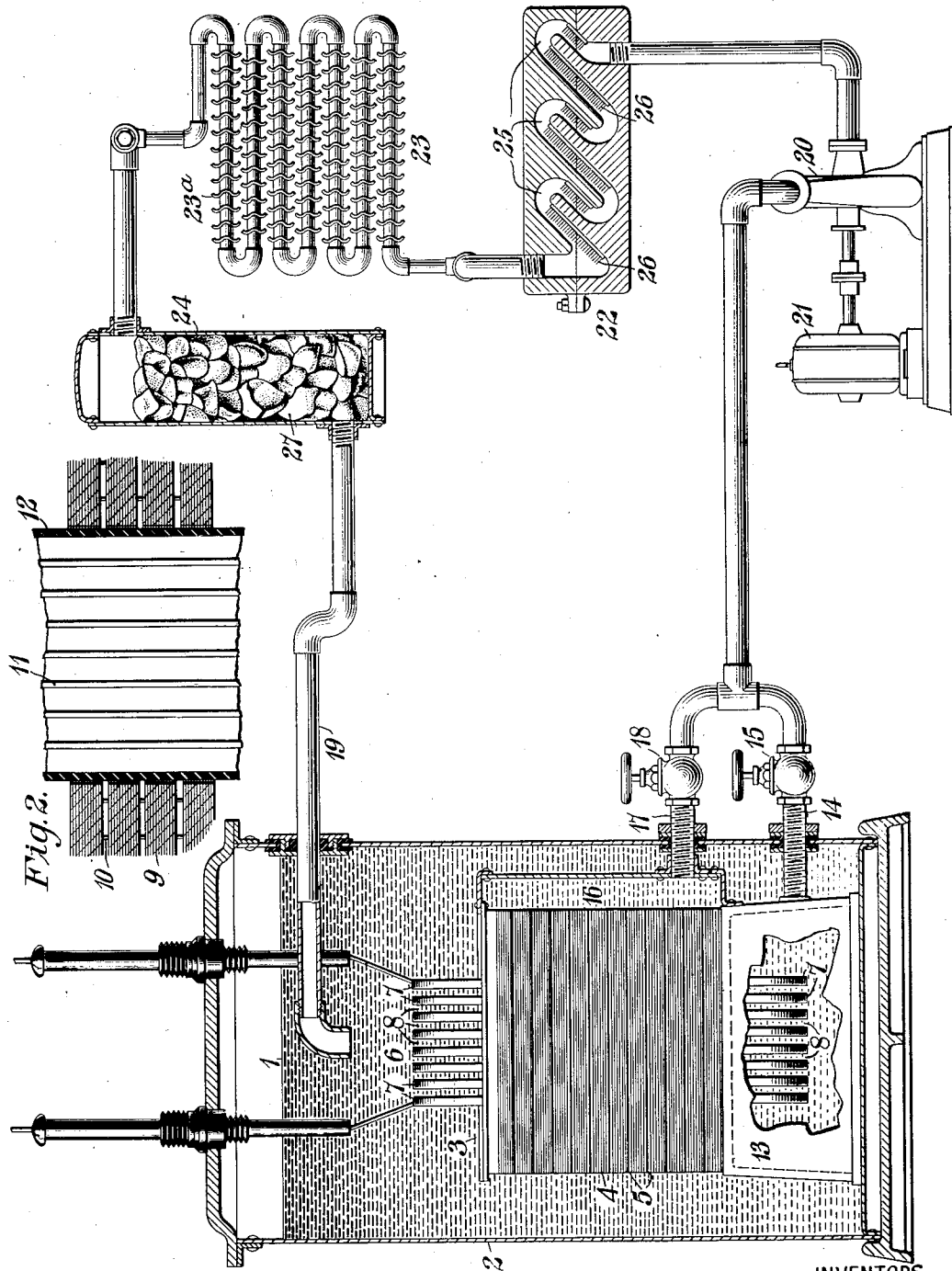


No. 854,312.

PATENTED MAY 21, 1907.

C. E. SKINNER & S. M. KINTNER.
MEANS FOR COOLING TRANSFORMERS.

APPLICATION FILED OCT. 3, 1905.



WITNESSES:

C. L. Belcher
Otto S. Schairer.

Fig. 1.

INVENTORS
Charles E. Skinner
& Samuel M. Kintner
BY
Wesley E. Carr
ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES E. SKINNER, OF WILKINSBURG, AND SAMUEL M. KINTNER, OF PITTSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

MEANS FOR COOLING TRANSFORMERS.

No. 854,312.

Specification of Letters Patent.

Patented May 21, 1907.

Application filed October 3, 1905. Serial No. 281,185.

To all whom it may concern:

Be it known that we, CHARLES E. SKINNER and SAMUEL M. KINTNER, citizens of the United States, and residents, respectively, of Wilkesburg and Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Means for Cooling Transformers, of which the following is a specification.

Our invention relates to electrical transformers and it has for its object to provide a novel and improved means for cooling the same.

Our invention consists principally in the provision of a system of circulation for the insulating liquid in which transformers are commonly immersed whereby ventilation of the winding and core structures may be effected independently and be separately regulated and whereby the insulating liquid may be cooled and foreign matter and moisture be removed therefrom.

Figure 1 of the accompanying drawings illustrates, partially in outline and partially in section, a transformer and a system of circulation embodying our invention and Fig. 2 is a sectional view of a portion of the transformer shown in Fig. 1.

Immersed in an insulating liquid 1 that is contained in a suitable receptacle 2 is a transformer 3 that comprises a laminated core structure 4 having transverse ventilating spaces 5 and a winding 6, that is composed of a plurality of coils 7 which are separated by ventilating spaces 8. The ventilating spaces 5 in the core structure may be provided by any well known means such as laminae 9 having raised or bent-up portions 10 and the spaces 8 between the coils may be formed by means of suitable strips 11, communication between the spaces 5 and 8 being prevented by means of a suitable insulating shell 12, that surrounds the straight side portions of the assembled coils.

The core structure 4 is supported upon a suitable hollow base 13 into which the lower ends of the coils 7 project, and the insulating liquid may be discharged thereinto by means of a pipe 14 that extends through the side of the receptacle 2 and is provided upon the exterior thereof with a valve 15 for regulating the volume of the stream which is discharged.

A suitable casing or shell 16 is secured upon one side of the magnetizable core structure 4 so as to provide a suitable chamber into which a pipe 17 may discharge. The pipe 17 extends through the side of the receptacle 2 and is provided with a regulating valve 18 upon the exterior of the receptacle. An exhaust pipe 19, that extends through the side of the receptacle 2 near its top, provides means whereby the warm insulating fluid may be removed from the receptacle.

The transformer and its receptacle are included in a system of circulation that comprises any suitable means for effecting flow of the liquid in the system such as a centrifugal pump 20 which may be operated by an electric motor 21 or any other prime mover, a filter 22 or other suitable means for removing foreign matter from the liquid, means for cooling the liquid such as that shown at 23, and a filter 24 for removing moisture from the liquid. As here shown, the filter for removing foreign matter comprises a zig-zag passage 25 in which are located suitable screens 26 or similar devices for obstructing the free passage of foreign particles. The cooling means 23 is here shown as comprising a plurality of lengths of pipe connected by return bends and upon which crimped disks 23^a are strung to provide a large superficial area for radiation.

A greater or less number of pipe lengths may be employed and the arrangement be otherwise modified, if desired. It will be also understood that the pipe or pipes may be subjected to the action of currents of air, water or other fluid in order to promote the desired cooling effect. The liquid may be dehydrated by passing it through a receptacle that contains calcium oxid 27 or other suitable anhydrous substance. It is, of course, understood that the structural details of these parts may be such as are found most convenient in practice and since they form no part of our present invention need not be shown and described more fully.

When the pump 20 is in operation, the insulating fluid is caused to circulate through the system and streams are directed respectively into the hollow base 13 and from thence through the ventilating apertures 8 between the coils 7, and into the casing 16 and from thence through the ventilating passages 5

in the magnetizable core structure, the volumes of the streams being regulated by means of valves 15 and 18. The insulating liquid which is drawn from the top of the receptacle is that which has absorbed heat from the transformer upon passage through the ventilating apertures, it being cooled and filtered in order to remove foreign particles and moisture before being returned to the transformer for ventilating purposes.

We claim as our invention:

1. The combination with a transformer having a casing, a laminated core structure provided with ventilating spaces and a winding comprising a plurality of spaced coils, of means for directing streams of insulating liquid respectively into the core spaces and the winding spaces, means for independently regulating the volumes of the streams, and means for withdrawing the united volumes of liquid from the top of the casing.

2. The combination with a transformer having a casing, a laminated core structure provided with ventilating spaces and a winding comprising a plurality of spaced coils, of means for directing independent streams of the liquid respectively into the core spaces and the winding spaces, means for regulating the volume of the streams, and means for withdrawing the united volumes of liquid from the top of the casing.

3. The combination with a transformer the core and winding structures of which are provided with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for directing independent streams of the liquid respectively through the core apertures and the winding apertures.

4. The combination with a transformer the core and winding structures of which are provided respectively with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for directing independent streams of the liquid respectively through the core apertures and the winding apertures and means for separately regulating the volume of the streams.

5. The combination with a transformer

the core and winding structures of which are provided respectively with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for effecting movement thereof, means for directing streams of the liquid respectively through the core apertures and the winding apertures and means for cooling the liquid.

6. The combination with a transformer the core and winding structures of which are provided respectively with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for effecting movement thereof, means for directing streams of the liquid respectively through the core apertures and the winding apertures and means for filtering the liquid.

7. The combination with a transformer the core and winding structures of which are provided respectively with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for effecting movement thereof, means for directing streams of the liquid respectively through the core apertures and the winding apertures and means for dehydrating the liquid.

8. The combination with a transformer the core and winding structures of which are provided respectively with ventilating apertures having non-communicating inlet ends, and an insulating liquid in which the transformer is immersed, of a system of circulation for the liquid comprising means for effecting movement thereof, means for directing streams of the liquid respectively through the core apertures and the winding apertures, means for cooling the liquid, means for filtering the liquid and means for dehydrating the liquid.

In testimony whereof, we have hereunto subscribed our names this 27th day of September, 1905.

CHARLES E. SKINNER.
SAMUEL M. KINTNER.

Witnesses:

A. M. SKINNER,
BIRNEY HINES.